

**DEPARTMENT OF THE ARMY
U.S. ARMY PATHFINDER SCHOOL
THE ARMY NATIONAL GUARD WARRIOR TRAINING CENTER
FORT BENNING, GEORGIA 31905**

071A0204

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HLZ SUMMARY SHEET:

INSTRUCTIONAL INTENT: To enable the Pathfinder student to plan for and operate day or night air assault operations. The student will learn how to plan, organize and operate a HLZ; coordinate with ground unit commanders and the duties and responsibilities of the different elements involved in the operation of an HLZ.

I. Helicopter Landing Zone Operations:

- A. Consideration Factors:** The factors that contribute to the process of HLZ site selection are grouped into two main categories:
1. **Tactical Considerations:** The considerations that pertain to the actual mission of the unit being moved. These considerations are the responsibility of the ground unit commander (GUC), and his staff and include the following:
 - a. The estimate of the situation using METT-TC (Mission, Enemy and friendly situations, Troops, Terrain and weather, Time available, and Civilians on the Battlefield).
 - b. Location of the objective from the tentative HLS.
 - c. Size of the element being moved.
 2. **Technical Considerations:** The considerations that pertain to the technical aspect of selection and operation of a day or night HLS. These are the responsibility of the Pathfinder and are subdivided into the **seven selection factors**:
 1. Size of the HLP
 2. Landing formations
 3. Surface conditions
 4. Obstacles
 5. Approach and departure routes
 6. Atmospheric conditions
 7. Type of load
- A. Size of helicopter landing point:** The size of the landing point will be decided by the aviation unit commander based on size/ type of aircraft, pilot/unit proficiency, whether the operation will take place during the day or at night, and atmospheric conditions.

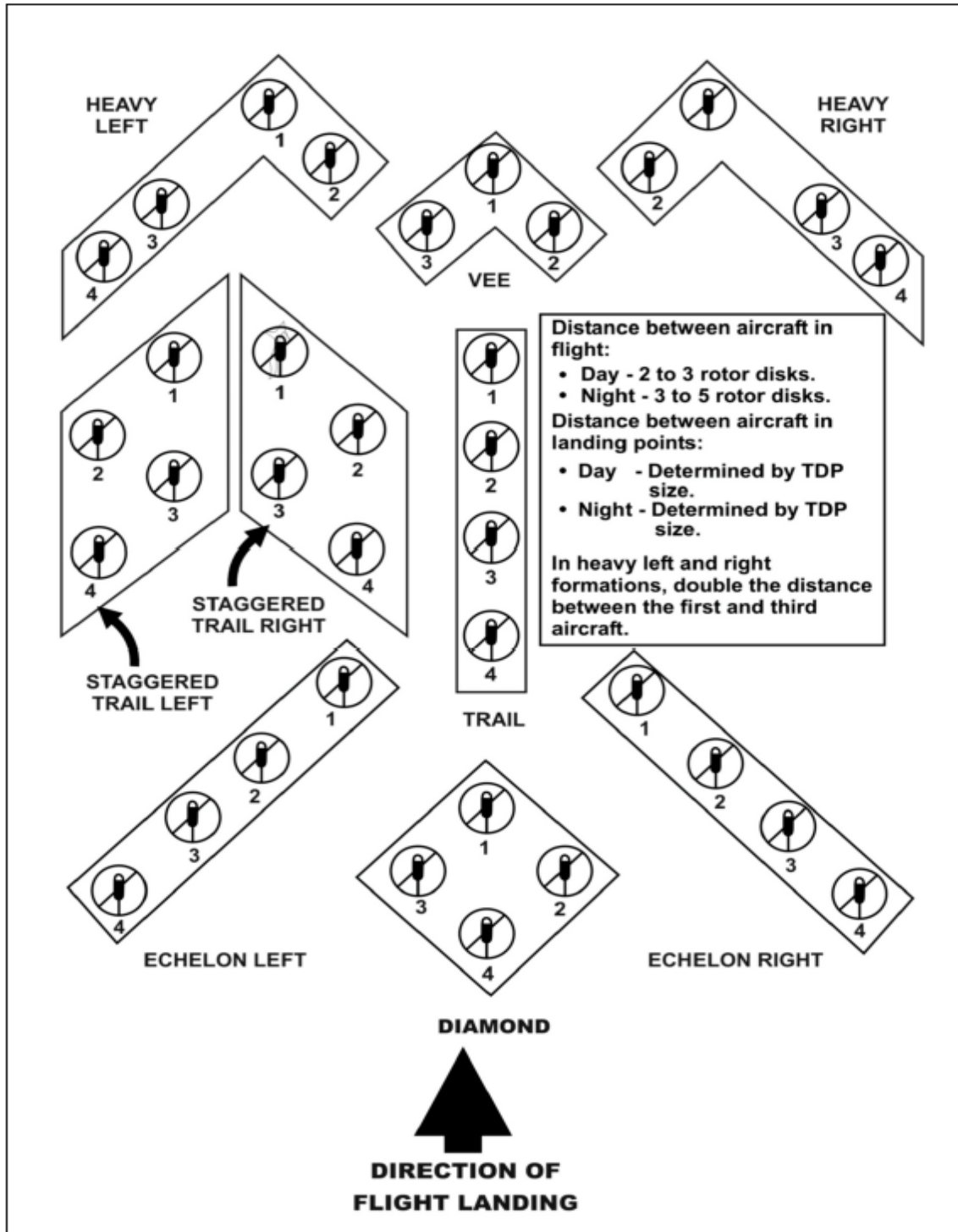
Aircraft Touchdown Point Sizes

	Type of AC:	Diameter of TDP
1	MH-6 / AH-6	10 Meters
2	UH-72A / OH-58D	15 Meters
3	AH-1W /AH-1Z / AH-64 / UH-1Y / UH-1N	20 Meters
4	UH-60A / UH-60L / UH-60M / SH-60	25 Meters
5	MV-22B / CV-22B	30 Meters
6	CH-47(D/F) / CH-53(E/K)	35 Meters
7	Desert/Snow Landing Zones	100 Meters
	Sling Load Aircraft(Day)	100 Meters
8	Sling Load long lines	125 Meters
9	Sling Load Aircraft (Night)	150 Meters

* NOTE: Distance between centers of TDP is 1.5 times the size of the touch point used for sizes 1-6.

B. Landing formation and number of aircraft: There are nine standard aircraft formations:

1. Trail
2. Staggered trail left
3. Staggered trail right
4. Echelon left
5. Echelon right
6. Heavy left
7. Heavy right
8. Diamond (**Most Secure**)
9. Vee



C. Surface Conditions at the site: Firm enough to support the weight of the aircraft and free of loose sand, snow, or debris (brown-out or white-out conditions).

NOTE: Add Enviromental considerations for Cold Weather, desert, and mountains.

D. Obstacles at or near the site:

- (1) All obstacles will be removed, reduced or marked. A landing point will never contain an obstacle. **(Obstacles are anything that is 18" high, wide or deep)**
- (2) Ground slope can be considered an obstacle. The table below shows slope restrictions for each aircraft.

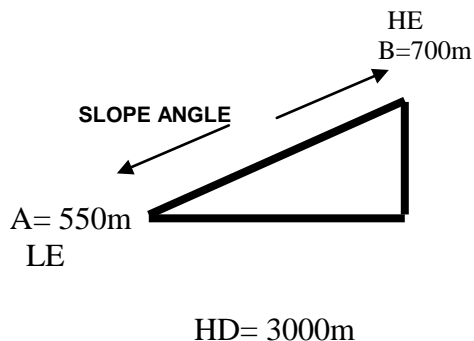
Type of AC	UH-1 (N/Y)	CH-53	OH-58D	MH-6 AH-6	MV-22 CV-22	UH-60 (A/L/M)	CH-47(D/F)
Max Slope	6	6	8	8	9	15	15

Always attempt to land the aircraft up-slope or side-slope. **NEVER** land an aircraft down-slope if at all possible! Slope is determined using the following formula:

DETERMINING GROUND SLOPE

GROUND SLOPE EXPRESSED IN DEGREES

THE APPROXIMATE SLOPE ANGLE MAY BE CALCULATED BY MULTIPLYING THE GRADIENT BY 57.3 THIS METHOD IS REASONABLY ACCURATE FOR SLOPE ANGLES UNDER 20 DEGREES.



$$VD = B - A$$

$$VD = 700 - 550 = 150m$$

$$HD = 3000m$$

$$\text{DEGREE OF SLOPE} = \frac{150 \times 57.3}{3000}$$

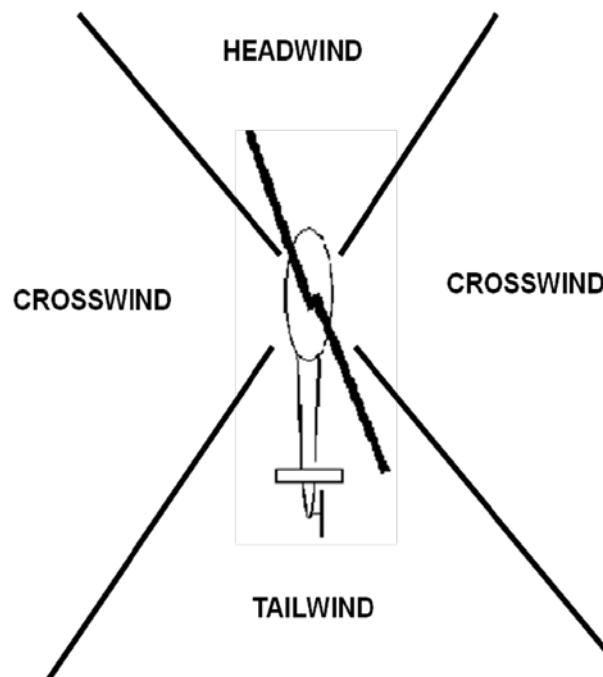
$$\frac{8595}{3000} = 2.865 \text{ rounded up to next whole number} = \underline{\underline{3 \text{ degrees}}}$$

E. Approach and Departure Routes: Ideally, approaches and departures are made along the long axis of the HLS over the lowest obstacle, and into the wind.

- (1) Approach and Departure: A 50 meter buffer or a 5:1 Obstacle Ratio (**whichever is greater**) will be given on approach and departure ends of the Helicopter landing site.
- (2) Left and Right sides of the site: A 10 meter buffer will be given to both sides of the site.

(3) Prevailing wind at the site. Use the following guidelines:

(a). **Always attempt to land aircraft into a head wind.** Wind direction of 45 degrees left or right of land heading considered a head wind.



(b). Crosswind and tailwinds for each aircraft are listed in table below.

A/C	UH-1N	UH-60 (A/L/M)	CH-53	MH-6 AH-6	MV-22 CV-22	OH-58	UH-1Y	CH- 46/47	AH-64
CROSSWIND	15	15	15	15	30	35	40	45	45
TAILWIND	15	15	15	15	10	20	40	10	45

(3) Departure heading (can vary up to 45 degrees either side of land heading)

F. Atmospheric conditions: Density altitude affects the aircraft allowable cargo load (ACL) for any given situation. It is comprised of three factors: Humidity, Altitude, and Temperature. As any of these factors increase, the performance capability of the aircraft decreases and the ACL is greatly reduced.

G. Type of Load:

- (1). Equipment or personnel
- (2) Internal or external loads

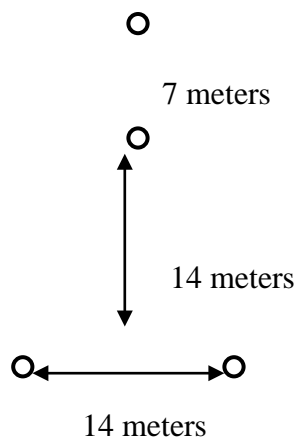
NOTE: There can be many types of loads or combinations of loads

II. Marking the HLS for Night Operations:

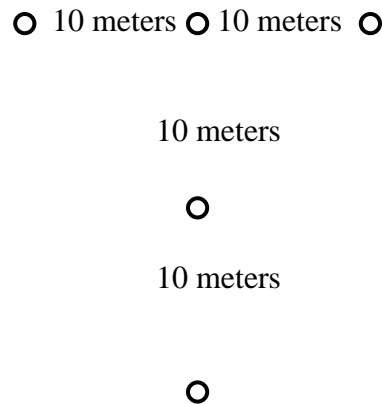
(1). Placement of the inverted "Y" or NATO "T" at the #1 TDP.

- a. Inverted "Y" for cargo aircraft will have 5 lights. The location of the fifth light will be determined through prior coordination with the supporting aviation unit.
- b. NATO landing "T" will be utilized if aircraft are approaching the site from 500 feet AGL or above or it is coordinated for. When using a Nato "T" you must add 20 meters to the total length of the site.

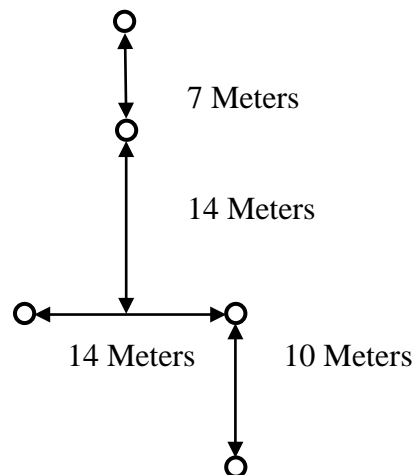
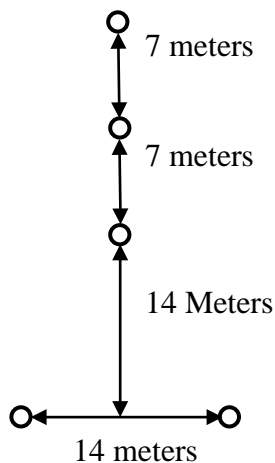
INVERTED "Y"



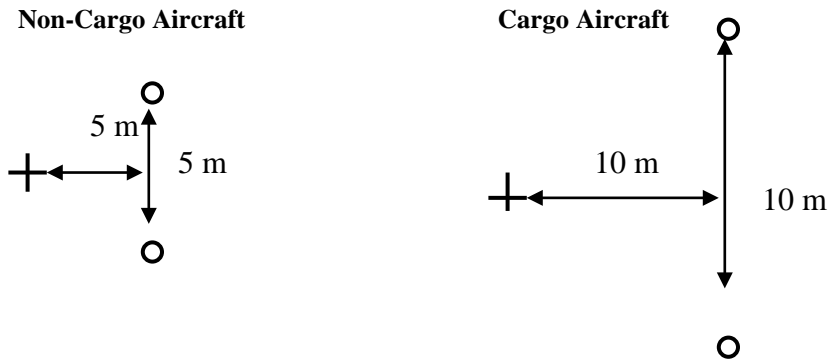
NATO "T"



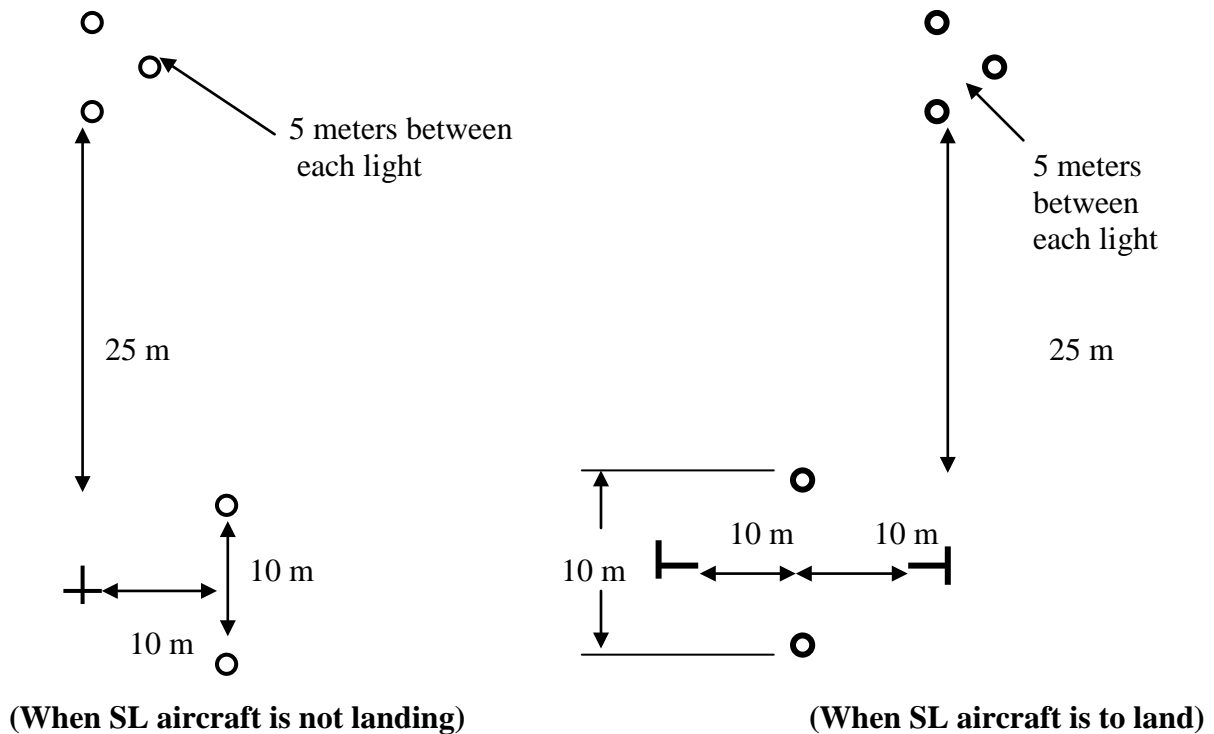
INVERTED "Y" with 5th light on top and bottom right (For Cargo AC or when coordinated for)



(2). TDP landing lights emplaced (10 meter separation for cargo aircraft, 5 meter separation for non-cargo aircraft).



(3) .SLP landing lights and load reference lights (if needed, placed in relation to the load).



3. Obstacle lights emplaced (**steady red**).

- a. At night red lights will look like white light when wearing NVG's. Also, aircrew members wear NVGs with filtered lenses. These filters do not allow the aircrews to see blue or green chem-lights. Colors such as yellow, orange, red, and infrared can be seen by pilots wearing ANVIS.
4. For security, pathfinders and the ground unit turn off, cover, or turn all lights upside down until the last practical moment before a helicopter arrives. Then they orient the lights in the direction from which the lead helicopter is approaching, and a signalman directs its landing.

III. Marking HLS for daytime operations:

1. A ground guide will mark the PZ or LZ for the lead aircraft by use of a signalman, or holding a rifle over his head, by displaying a folded VS-17, or by other identifiable means.

IV. **Establishment of the HLS:**

1. Determine the land heading: Prioritize as follows:

- a. Long axis of the site.
- b. Wind direction and speed
- c. Slope at the site

2. Place GTA. Consider the following:

- a. Good 360 degree observation of the site
- b. Not placed inside a cleared area
- c. Opposite the CCP

NOTE: The site can now accept one aircraft "at a hover."

3. Determine the obstacle ratio at the approach and departure ends of the site and establish the location of the #1 TDP.
4. Call the marking party forward. Place the INR using the same considerations as with the GTA. Ensure that the INR can cover any of the GTA's dead space. Make sure that a distance of not less than 25 meters separates all operating radios.
5. Establish/Mark the site:
 - a. ATL supervises designation and marking of the TDP's in order, first to last. Other members of the marking party begin clearing the TDP's. The GTA and INR update the ATC block of their maps as each point is cleared.
 - b. SL point team leader selects the tentative location of the sling load point using the following criteria:
 - (1) SL point will be located no less than 100 meters from the nearest active TDP in the formation for unlike or unknown aircraft types.
 - (2) SL point can be located no less than 80 meters from the nearest active TDP in the formation if all the aircraft are alike. ("Like A/C" means same size TDP.)
 - (3) Diameter of the SL point is determined by four factors; Size of the aircraft, Day or night operation, Pilot/unit proficiency, and Atmospheric conditions.
 - c. All TDP's are cleared.
 - d. 10 minutes prior to mission time the following will be accomplished:
 - (1). All radios set to the primary frequency.
 - (2). All personnel in the proper uniform and in position to perform their respective duties. All signalmen in their proper location ready to guide aircraft.
 - (3) ATC blocks of the GTA's and INR's maps are complete, accurate and alike. All signaling devices are out and ready for use.
 - (4). Site is operational for daytime operations.

V. AIR LOADING AND SAFETY:

A. Prepare troops and their equipment for air

1. Brief loading procedures.
2. In-flight procedures.
3. Ensure all personnel have appropriate gear.

B. Methods used to approach Army aircraft:

1. Occupy and secure the PZ position and ready personnel and equipment for loading.
2. Move towards the aircraft only after it has landed.
3. Approach the aircraft at a crouch. Be aware of items such as antennas.
4. If the aircraft has landed on a slope, approach it from the down slope side.
5. Approach the following types of aircraft as indicated:
 - a. UH-1 helicopter: Approach from 45 degrees off the front of the aircraft.
 - b. UH-60 helicopter: Approach directly from the sides. Use this same approach for OH- 58, OH-6 and cargo helicopters when using the forward troop doors.
 - c. For cargo helicopters (CH-47, CH-46, and MV-22B) when using the rear ramp: Approach from 45 degrees off the rear of the aircraft. . For CH-53 helicopter approach only from the right rear in order to avoid the tail rotor.

NOTE: NEVER approach utility or light observation helicopters (Other than the UH-72A) from the rear due to the tail rotor hazard. The UH-72A is a right side as well as a tail loading Medevac A/C.

C. Loading the aircraft and actions while in flight:

1. Load in reverse order, first in, last out.
2. Secure all loose items and check all cargo lashings.
3. **DO NOT** place equipment under troop seats. The seats are designed to collapse in the event of a crash, absorbing some of the energy of the impact.
4. All seat belts will be fastened and remain fastened during the flight.
5. All troops will remain seated during the flight.
6. No smoking is allowed aboard aircraft.
7. Individual weapons will not be fired from an aircraft at any time.

8. Individual weapons will be oriented as indicated:
 - a. Muzzle up on board UH-1(N/Y) helicopter.
 - b. Muzzle down on board UH-60, OH-58 and CH-47 helicopters.

D. Aircraft off-loading procedures:

1. Do not off-load prior to being instructed to do so by the aircrew.
2. Do not move toward the rear of observation or utility type helicopters due to the tail rotor hazard.
3. For aircraft on a side slope, exit on the down slope side.
4. Take 2 to 3 steps and assumes a prone position, facing away from the aircraft, until the aircraft departs.

F. Emergency exits:

A/C Type	Number of Emergency Exits	Location
OH-58	2	Crew doors
UH-1	4	Pilot doors and troop doors
UH-60	6	cockpit doors and cabin windows
MV-22B	6	6 Crew door, Ramp, both pilot windows and 2 blow out windows
CH-47	11	3 Primary (Ramp/Doors) 8 Secondary (Windows)

VI. DESERT AND WINTER OPERATIONS

A. The three preferred landing formations are:

1. Echelon Right
2. Echelon Left
3. Trail

* These formations will limit the amount of sand /snow taken into the engines of the A/C.

B. Run in Landings:

A run in type landing is when the A/C touches down and continues to roll forward to a stop so that the Brown out/ White out conditions are limited. When doing this the A/C typically will only do it in an Echelon formation.

C. UH-60M/CH-47F

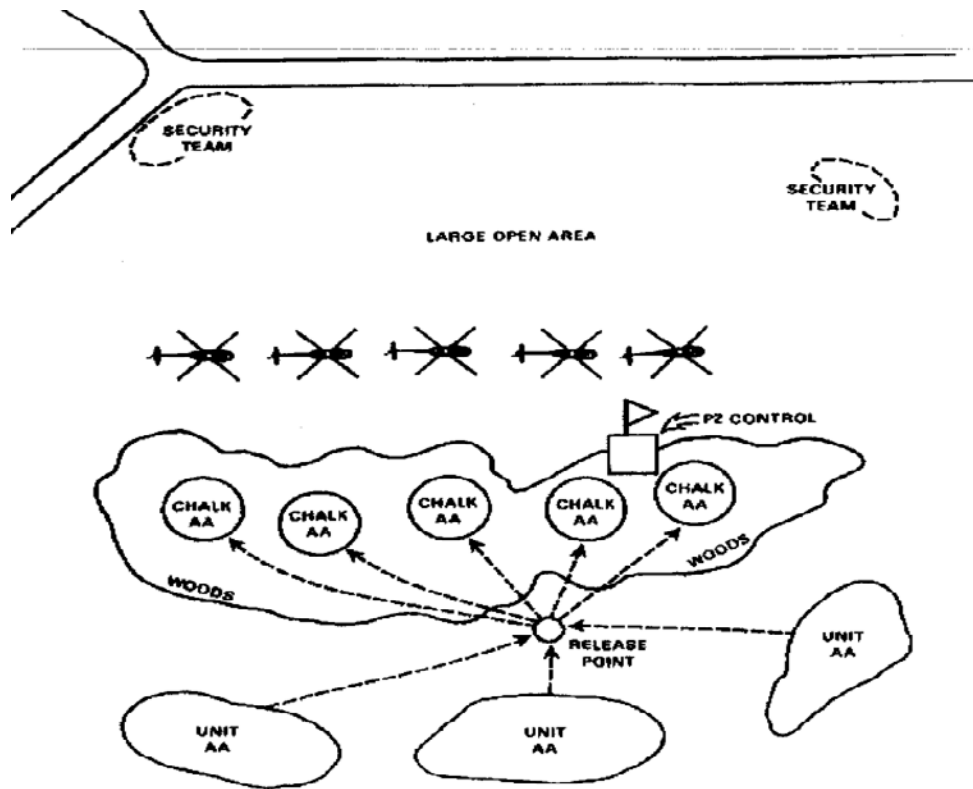
These two A/C have an additional system called the Land-Safe System. This system assists the pilot in landing where the ground is difficult to see. When using this system the pilot can simply hover above the landing site, arming the system. When this system is armed the helicopter uses fiber optics to gradually lower to the ground safely without the pilot having to see the ground. This system is used for sand, snow, fog, rain, and any other limited visibility situations.

D. The minimum safe distance between all A/C in will be no less than 100Meters. It is recommended that all Slingload A/C have a distance of 150 Meter separation.

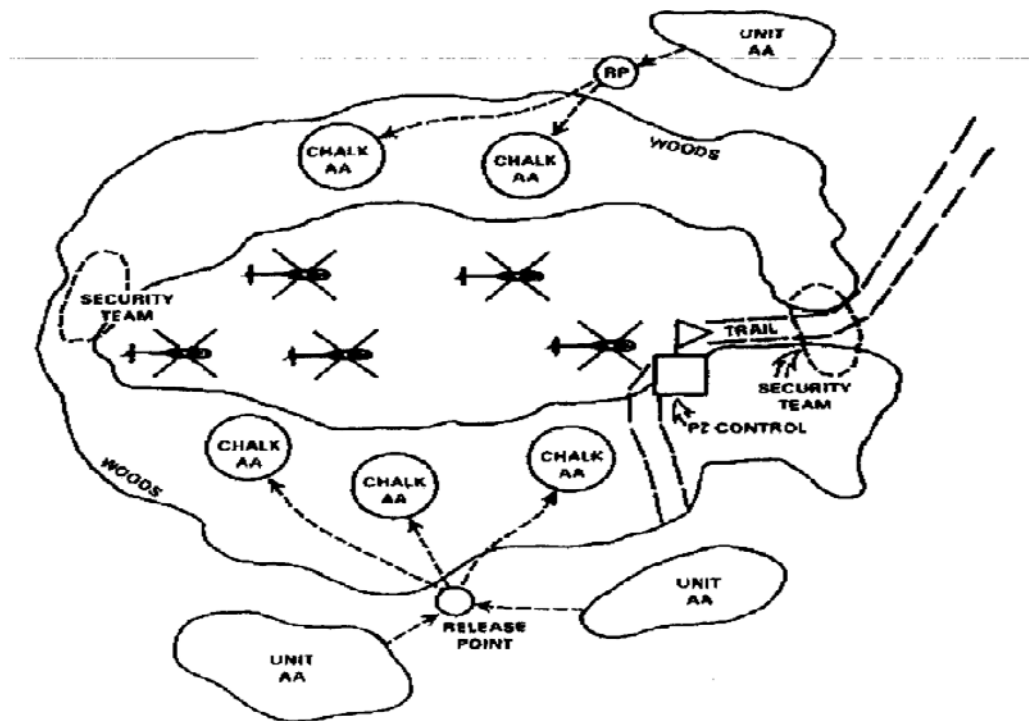
VII. Pick up Zone

- 1. Movement to and occupation of chalk assembly area.** Linkup guides from the PZ control party will meet with designated units in the unit assembly area and coordinate movement of chalks to a release point. As chalks arrive at the release point, chalk guides will move each chalk to its assigned chalk assembly area. When operating as part of a larger air assault operation, no more than three chalks should be located in the chalk assembly area at one time. Noise and light discipline will be maintained throughout the entire movement in order to maintain the security of the PZ. Additionally, no personnel should be allowed on the PZ unless loading aircraft, rigging for sling load, or directed by PZ control.

2. Example of an one sided PZ.

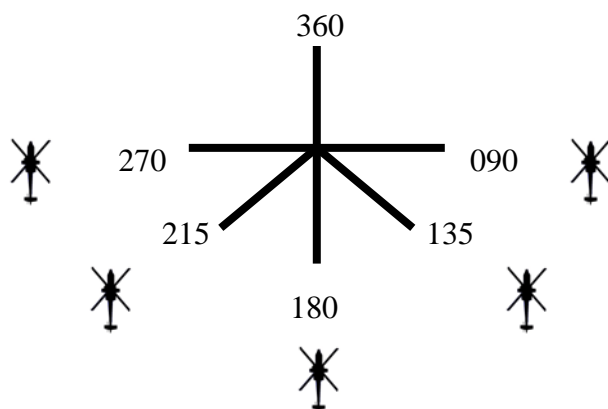


3. Example of two sided PZ.

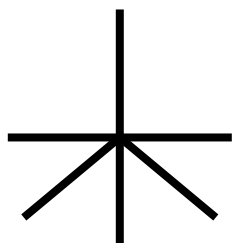


Crows Foot Exercises

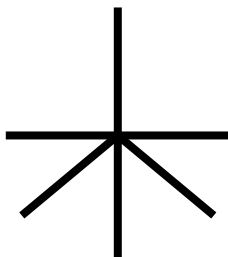
Land Heading- 360



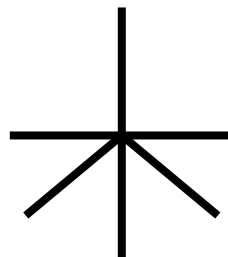
Land Heading- 021



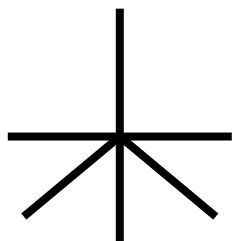
Land Heading-172



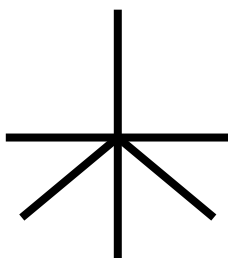
Land Heading-297



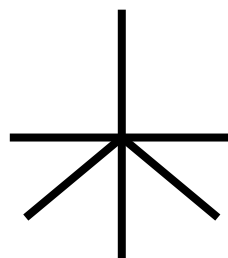
Land Heading- 324



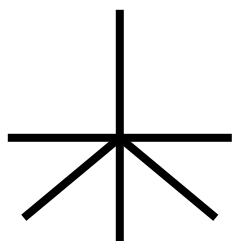
Land Heading-125



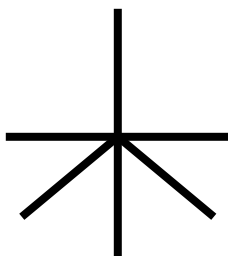
Land Heading-053



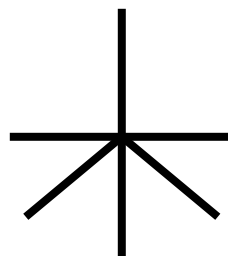
Land Heading- 268



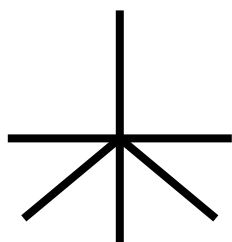
Land Heading- 112



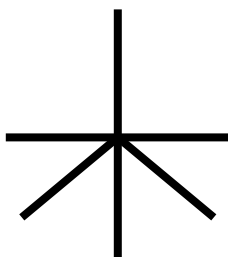
Land Heading-356



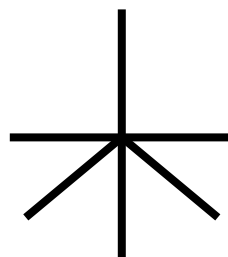
Land Heading- 009



Land Heading- 217



Land Heading-047

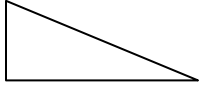


SLOPE HOMEWORK

INSTRUCTIONS:

1. Determine the degrees of slope in each problem.
2. Determine which type of aircraft can land.
If all aircraft can land, answer ALL.
If no aircraft can land, answer NONE.
3. Determine what advisories must be given and to which aircraft prior to landing, if any.
“**BE ADVISED.....**” “All no fly areas are in effect”
4. Show your work.

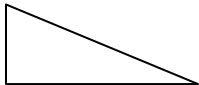
1. HE= 112'
LE= 58'
HD= 200 meters



ANSWER:
ADVISORIES:

TYPE OF AIRCRAFT:

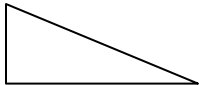
2. HE= 45'
LE= Sea Level
HD= 200 feet



ANSWER:
ADVISORIES:

TYPE OF AIRCRAFT:

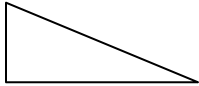
3. HE= 462'
LE= 425'
HD= 240 meters



ANSWER:
ADVISORIES:

TYPE OF AIRCRAFT:

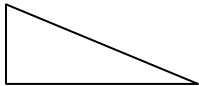
4. HE= 201'
LE= 60'
HD= 500 feet



ANSWER:
ADVISORIES:

TYPE OF AIRCRAFT:

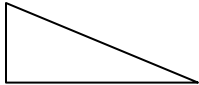
5. HE= 720'
LE= 650'
HD= 100 meters



ANSWER:
ADVISORIES:

TYPE OF AIRCRAFT:

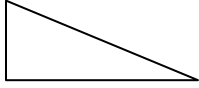
6. HE= 312'
LE= 50M
HD= 1200M



ANSWER:
ADVISORIES:

TYPE OF AIRCRAFT:

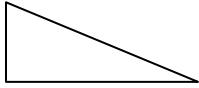
7. HE= 360M
LE= 220M
HD= 4200'



ANSWER:
ADVISORIES:

TYPE OF AIRCRAFT:

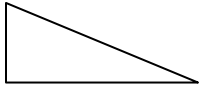
8. HE= 670'
LE= 240'
HD= 1110M



ANSWER:
ADVISORIES:

TYPE OF AIRCRAFT:

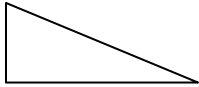
9. HE= 110M
LE= 37M
HD= 400M



ANSWER:
ADVISORIES:

TYPE OF AIRCRAFT:

10. HE= 390'
LE= 233'
HD= 4200'



ANSWER:
ADVISORIES:

TYPE OF AIRCRAFT:

Formation Matrix

	FORM TYPE	# A/C					
		1	2	3	4	5	
		TDP SIZE	L/W (in Meters)				
1½ TDP sizes	TRAIL R&L	1	10	15/30	30/30	45/30	60/30
		2	15	23/35	45/35	68/35	90/35
		3	20	30/40	60/40	90/40	135/40
		4	25	38/45	75/45	113/45	150/45
		5	30	45/50	90/50	135/50	180/50
		6	35	53/55	105/55	158/55	210/55
1½ TDP sizes	ST R&L	1	10	21/41	32/41	43/41	54/41
		2	15	26/46	42/46	58/46	74/46
		3	20	31/51	52/51	73/51	94/51
		4	25	37/57	64/57	91/57	118/57
		5	30	42/62	74/62	106/62	138/62
		6	35	47/67	84/67	121/67	158/67
1½ TDP sizes	E R&L	1	10	21/41	32/52	43/63	54/74
		2	15	26/46	42/62	58/78	74/90
		3	20	31/51	52/72	73/93	94/114
		4	25	37/57	64/84	91/111	118/138
		5	30	42/62	74/94	106/126	138/158
		6	35	47/67	84/104	121/141	158/178
2 TDP sizes	HVY R&L	1	10	21/41	32/53	43/64	54/74
		2	15	26/46	42/78	58/94	74/110
		3	20	31/51	52/93	73/114	94/135
		4	25	37/57	64/111	91/138	118/165
		5	30	42/62	74/126	106/158	138/190
		6	35	47/67	84/141	121/178	158/215
2 TDP sizes	DIAM	1	10	21/41	21/52	32/52	
		2	15	26/46	42/62	58/62	
		3	20	31/51	52/72	73/72	
		4	25	37/57	64/84	91/84	
		5	30	42/62	74/94	106/94	
		6	35	47/67	84/104	121/104	
2 TDP sizes	VEE	1	10	21/41	21/52	32/63	32/74
		2	15	26/46	42/62	58/78	58/94
		3	20	31/51	52/72	73/93	73/114
		4	25	37/57	64/84	91/111	91/138
		5	30	42/62	74/94	106/126	106/158
		6	35	47/67	84/104	121/141	121/178